The resonance of a nucleus in a molecule is affected by the proximate non-equivalent nuclei (see equivalent ligands). This phenomenon is known as spin coupling or, simply, coupling. eg. 1:

In 1, \( H_a \) and \( H_b \) are non-equivalent. They are on adjacent carbon atoms and, therefore, in close proximity. Consequently, the resonance of \( H_a \) is affected by that of \( H_b \) and vice versa. eg. 2:

In 2, \( H_a \) and \( H_b \) are non-equivalent. They are on the same carbon atom and, therefore, in close proximity. Consequently, the resonance of \( H_a \) is affected by that of \( H_b \) and vice versa.

The multiplicity and the splitting pattern of an NMR peak of a given nucleus in a molecule is determined by the number of nuclei it is coupled to. Hydrogen nuclei in organic molecules couple with geminal hydrogens and with vicinal hydrogens. Coupling between hydrogen nuclei farther apart is observed occasionally and known as long-range coupling.

see also (n+1) Rule

Contributors

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